Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Advanced Television Systems and Their Impact on the Existing Television Broadcast Service	)	
	)	
Review of Technical and Operational Requirements: Part 73-E, Television Broadcast Stations	)	MM Docket No. 87-268
	)	
Reevaluation of the UHF Television Channel and Distance Separation Requirements of Part 73 of the Commission's Rules	)	

COMMENTS OF NATIONAL PUBLIC RADIO

National Public Radio (NPR) offers the following Comments in response to the Tentative Decision and Further Notice of Proposed Rule Making in the above identified docket. In these Comments, NPR renews its previous request that the Commission take into account the needs and interest of advanced radio and digital audio technology in its consideration of spectrum issues for advanced broadcast technologies.

NPR is a nonprofit, noncommercial organization which provides programming and interconnection services to 360 full-service public radio stations and which represents them in developing and maintaining a viable and diverse public radio service for the American public.

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The Commission has tentatively decided to limit the development of High Definition TV (HDTV) and other advanced television systems (ATV) to the existing broadcast spectrum allocated to television service.1/ NPR supports that decision because it does not impede the development of advanced radio technology which may require the use of other spectrum. NPR offers these comments in support of the Commission's adoption of this tentative decision.

I. The Commission Should Adopt Its Tentative Decision To Use Existing TV Spectrum for ATV

A. The Commission Should Act Now To Encourage Further Development of Advanced Radio Technology

The Commission has announced that the challenge presented by this docket is "to design and implement a framework for the next generation of broadcasting that will promote efficient realization and wide dissemination of the benefits of this new technology, yet also will permit incorporation of future technological improvements in a timely and efficient manner." 2/ NPR concurs with the importance of considering future

1/ "Tentative Decision and Further Notice of Inquiry" (TD/FNOI), paragraph 4, ("3. We also tentatively conclude that any spectrum capacity needed for broadcast ATV system will be obtained from the spectrum now allocated to broadcast television. In the interests of efficient use of the spectrum and minimization of disruption to other services, we do not intend to consider the use of any frequency bands not already allocated for television terrestrial broadcasting.")

2/ See, TD/FNOI, paragraph 2.

technological improvements in this Docket. The Commission should act with informed vision to insure the orderly development of advanced radio technologies which also have important spectrum requirements. Consideration of spectrum issues beyond HDTV and ATV such as advanced radio and digital audio technologies lends support to the Commission's decision to limit ATV to spectrum now allocated to television terrestrial broadcasting.

B. Radio Broadcasting Provides Important Public Service

The Commission has recognized that (1) broadcast stations make a unique service freely available to the American public and that (2) initiating an advanced television system may be necessary to preserve the benefits of the existing system.3/ Radio broadcasting is an integral part of that unique free entertainment and informational programming service and must be allowed to take advantage of advancing technology, such as digital audio, in order to remain competitive and to continue to provide high quality programming. Just as more advanced visual technologies, such as ATV, improve television picture and sound, improved sound technology and equipment are being examined with a view toward enhancing audio programming. Most of the audio technology advances are based on digital encoding techniques.

3/ See, TD/FNOI, paragraph 39.

C. Digital Audio Technology

In radio and television studios across the country, broadcasters are replacing analog audio processing equipment with digital audio processing equipment. Digital processing allows storage and retrieval of audio information without degradation. However, since digital signal processing is currently limited to broadcast production, broadcasters cannot transmit digital signals and take full advantage of digital technology. Digital broadcasts would complete the transmission chain and offer significant improvements in audio quality.

The advantage of a digital audio broadcast lies in its immunity to noise and interference, which results in the recreation of clean audio identical to the original sound. Currently FM broadcast stations modulate their frequency by a signal which attempts to imitate the actual sonic waveform (or "analog".) A digital broadcast would modulate its carrier with a high density datastream--a series of "on or off pulses" at a high rate of speed creating a digitized representation of the original sound wave. Assuming an uninterrupted datastream, the digital sound is essentially impervious to any degradation while it is in digital form and can be transmitted over a wide range of reception conditions. The general audio quality would thus be higher than conventional FM broadcasts--roughly equivalent to compact disc quality.

D. Advanced Radio Technologies Will Require Additional Spectrum

NPR has noted in its earlier comments filed in this docket, that new audio technologies are in various stages of planning and development. This is occurring both within the framework of HDTV and independent of HDTV. Just as the ATV technologies have increased spectrum requirements, so too will the advanced audio technologies require transmission bandwidths wider than those presently allocated to FM broadcasters.

The proposed ATV systems could be accommodated within the existing 6 mHz channel bandwidth and in the existing broadcast spectrum (on what is to be called an augmentation channel) allocated to television. It does not seem likely that advanced radio systems incorporating digital techniques will be feasible using existing AM or FM bandwidths. In addition, downward compatibility (continued use of existing radio receivers to receive analog signals) for advanced radio systems would be impossible. Therefore, new spectrum will almost certainly be required. At the same time, the additional spectrum requirements will not be enormous. For example, given existing and foreseen technologies, a digital stereo signal could consume as little as 250 to 500 kHz.

Given the complex and interrelated spectrum management issues which are involved, the Commission should include consideration of new audio options in this comprehensive review of spectrum usage. NPR supports the Commission's tentative decision not to

use additional spectrum allocation outside the existing VHF and UHF broadcast television allocations for ATV.4/ Such a decision by the Commission will preserve the option of use of other spectrum for advanced radio technology.

E. There Are Statutory Mandates For the Commission To Encourage Advanced Radio Technologies

The Commission has statutory mandates to (1) encourage the provision of new technologies and services to the public and (2) encourage the larger and more effective use of radio in the public interest.5/ Advanced audio technologies will provide high quality programming to the public and the Commission must act now to assure that the benefits of new advanced radio technology will be realized in the future.6/

The Commission should not make spectrum management decisions in this docket which foreclose the evolution and development of new radio technologies. The public is best served with the assurance that advanced audio as well as advanced video technologies will become available in the years to come.

4/ See, footnote 1.

5/ See, 47 USC 157 (Supp. 1987) and 47 USC 303(g) (Supp. 1982).

6/ The Senate Report accompanying the "Public Telecommunications Act of 1988" (Report 100-444) notes that "One of the goals of this Act is to encourage the expansion of public radio.... Moreover, the incorporation of digital audio into the current system requires more bandwidth and power per [satellite] channel.... Public radio licensees, however, should have the capacity to incorporate some digital service into their system in the future years."

F. Advanced Radio and Audio Technologies Are Evolving

In NPR's 1987 comments in this docket, we described the experimental digital broadcasts being tested at WGBH-FM in Boston, Massachusetts and the Digital Broadcast Radio (DBR) system being developed by the Digital Broadcast Radio Corporation. Since the filing of those comments, new digital audio applications have been described which further demonstrate the importance of Commission action assuring that future spectrum needs of radio broadcasters will be met.

For example, the Radio '88 Conference included an eight-hour session on the "Digital Radio Station." The seminar covered topics ranging from use of digital technology for productions to storage and transmission.7/ Many elements of radio station operation currently utilize digital technology and work is proceeding on digitizing the transmission/reception link.8/

A completely digitally processed FM stereo broadcast system has been proposed by the Digital R.F. Solutions, Inc. (DRFS) of Santa Clara, California. Using direct digital synthesis (DDS) techniques, DRFS has advanced the benefits of digital audio processing to the FM stereo generator and the RF exciter. Similar uses of digital RF processing have been employed by the

7/ See, "Digital Will Change Radio, Experts Say," Radio World, October 15, 1988, page 7.

8/ See, "Digital Products in Broadcast: Getting Tomorrow's Audience," Radio World, June 1, 1988, pages 16-17.

Harris Broadcast Group in developing the DX series of digitally modulated solid state AM transmitters. In both the AM and FM configurations, the evolution of digital technology has increased the potential for transmitting RF signals in the digital rather than analog domain.

The spectrum space required for digital radio transmission will be a function of the bit rate required in simple radio-only systems. In order to maintain equivalent analog bandwidth and dynamic range in digital RF domain, appropriate transmission standards for digital transmission protocol must be defined. Although a specific proposal has yet to be devised, the development of such standards is inevitable.

The DRFS FM digital sythesis technique uses a number controlled modulated oscillator (NCMO) approach to direct digital synthesis. Among its advantages is the fact that it can be adapted to any future data communications formats. The research and development that has gone into this technology represents an investment in the next dimension of radio that should be accomodated by the Commission by preserving spectrum of this time.

The broadcast industry is poised to take advantage of the new and exciting improvements in audio technology, including the use of digital transmission. Now is the time for the Commission to act to assure that those opportunities will be realized by the listening public in the years to come.

II. Conclusion

NPR supports the Commission's adoption of its tentative decision to limit ATV to the existing television allocation of broadcast spectrum. In reaching this decision, the Commission should consider the spectrum needs of advanced radio and digital audio technologies. Such a comprehensive review of spectrum issues in this Docket will ensure the orderly development of audio technologies by making spectrum decisions which allow timely and efficient incorporation of future audio technological developments.

Respectfully submitted,

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